



From Risk to Opportunity:

Insurer Responses to Climate Change

Evan Mills, Ph.D.
Staff Scientist
U.S. Department of Energy
Lawrence Berkeley National Laboratory

FSA Annual Insurance Sector Conference
April 8, 2008



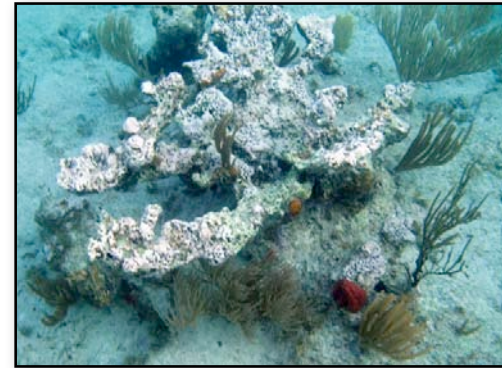
Climate Change is not Separate from “Mainstream” Issues

- Balance sheet strength & solvency
- Competitiveness
- Customer care: availability & affordability
- Need for and adequacy of disclosure
- Emerging markets
- Corporate governance
- Reputation & trust
- Modeling weaknesses; Past vs future
- Regulatory reform

Roadmap

- State of knowledge on climate change
- Relevance for the insurance community
- Perceptions of insurers and related stakeholders
- Business opportunities
- Challenges for insurers & regulators

Caribbean: Coral Die-Off



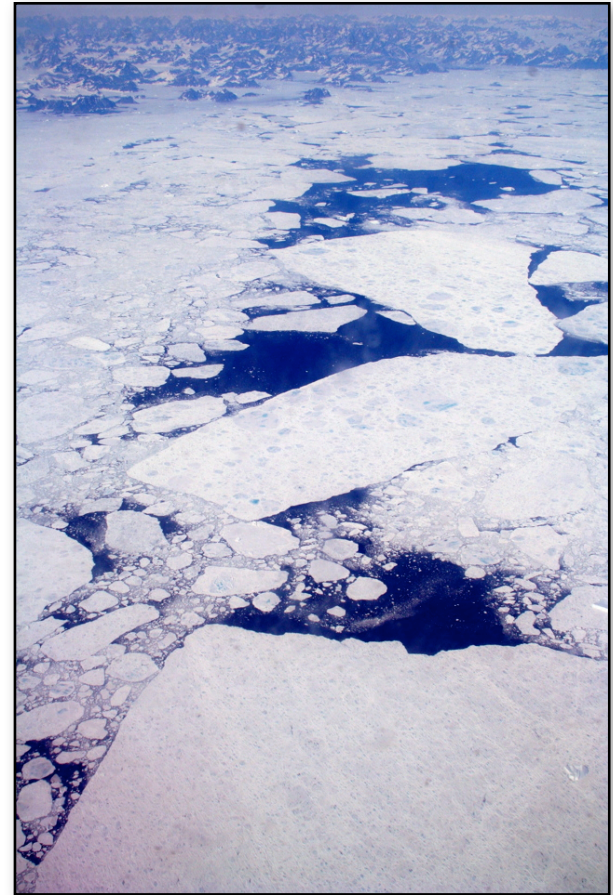
Tanzania: Drought > Blackouts



Iceland: Retreating Glaciers



Greenland: Loss of Sea Ice



California: Beetle Super-infestation; Wildfire



The Scientific Consensus

Nobel Peace Prize: 2007

Intergovernmental Panel
on Climate Change

~1500 Authors;

1000 Reviewers

Unanimously adopted by 100+
nations (including U.S.)

**“Warming of the climate system is unequivocal,
as is now evident from observations of increases
in global average air and ocean temperatures,
widespread melting of snow and ice, and rising
global mean sea level.”**

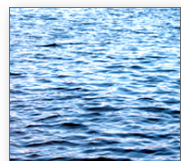
- *IPCC Fourth Assessment Report (2007)*

<http://www.ipcc.ch>

Direct Observations of Recent Climate Change: IPCC



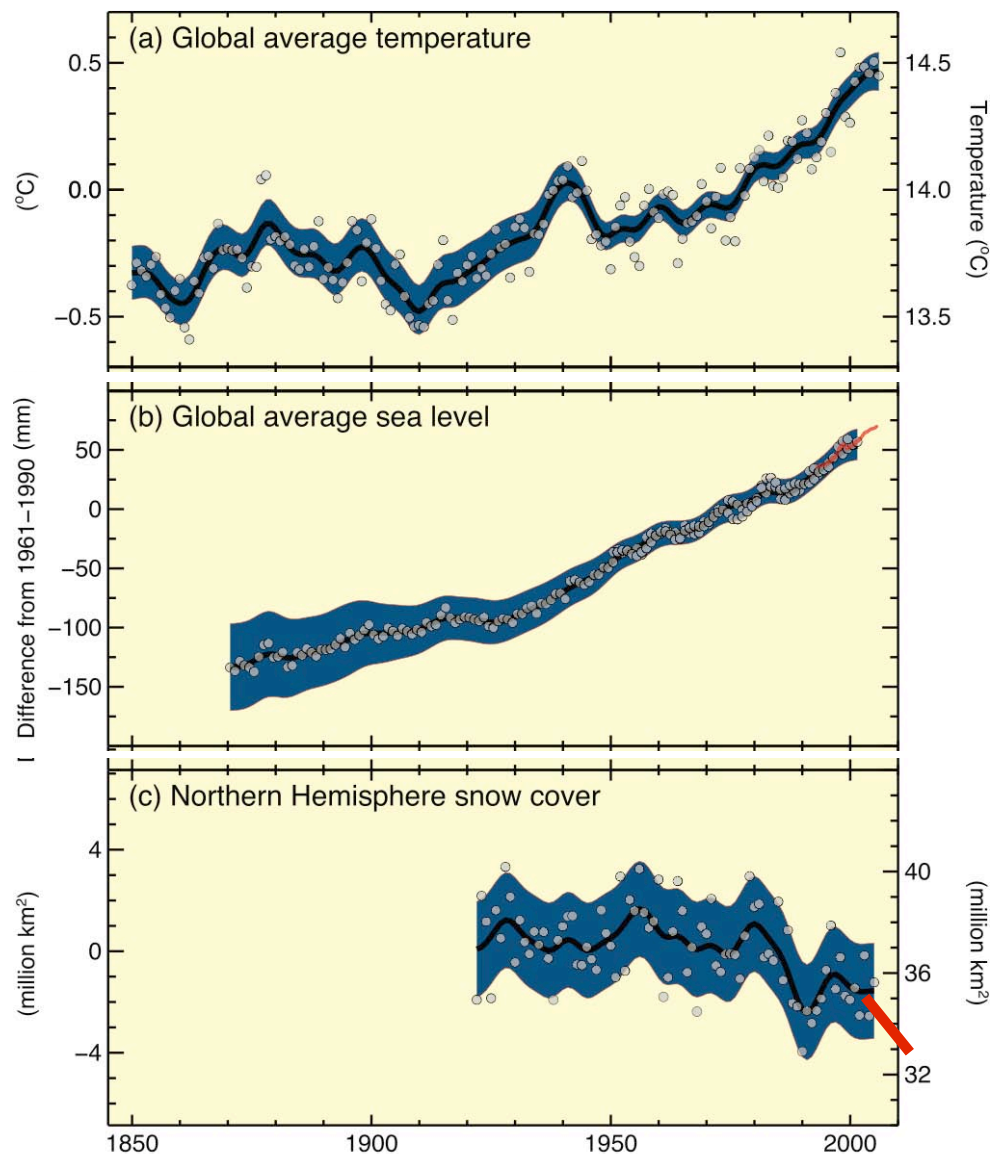
Global average temperature
(*accelerating*)



Global average sea level



Northern hemisphere
snow cover
(*accelerating*)



Source: IPCC 4th Assessment (2007)

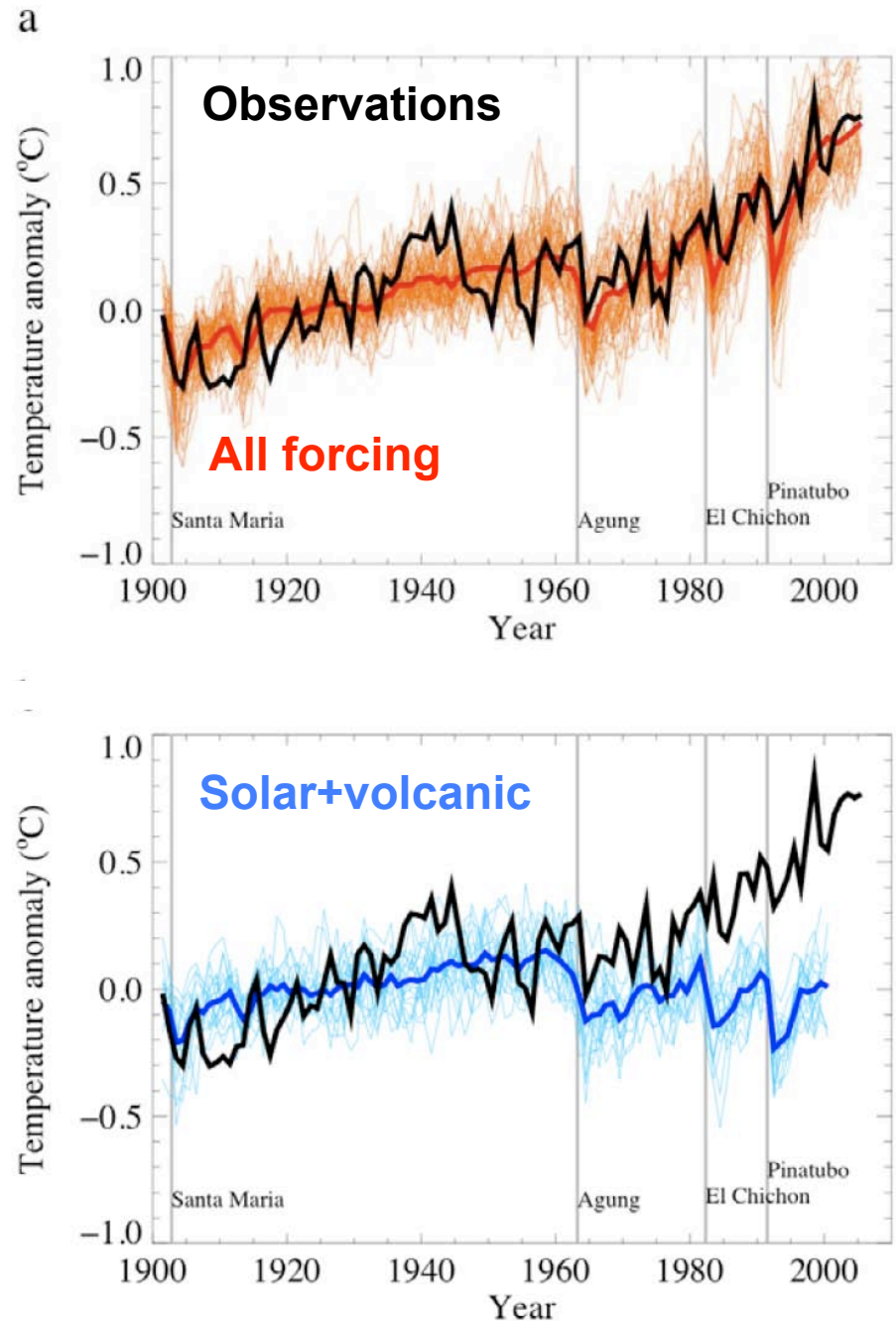
Key Messages from the IPCC

1. The climate is changing (*faster* than previously expected) & uncertainties are shrinking - underestimating future impacts
2. Humans are primary cause; no validated alternate theory
3. The climate will continue to change (ocean lags)
4. Multiple impacts are *already* observable
5. Disruptive impacts are expected at 2 - 3 degrees of warming (450 ppm); postponing reductions increases cost & difficulty
6. Impacts vary materially across range of plausible warming
7. There is (considerable) hope for curbing climate change
 - Costs ~ 0.1% per year in GDP, *excl. avoided damages*
8. Solution requires emissions reductions and adaptation

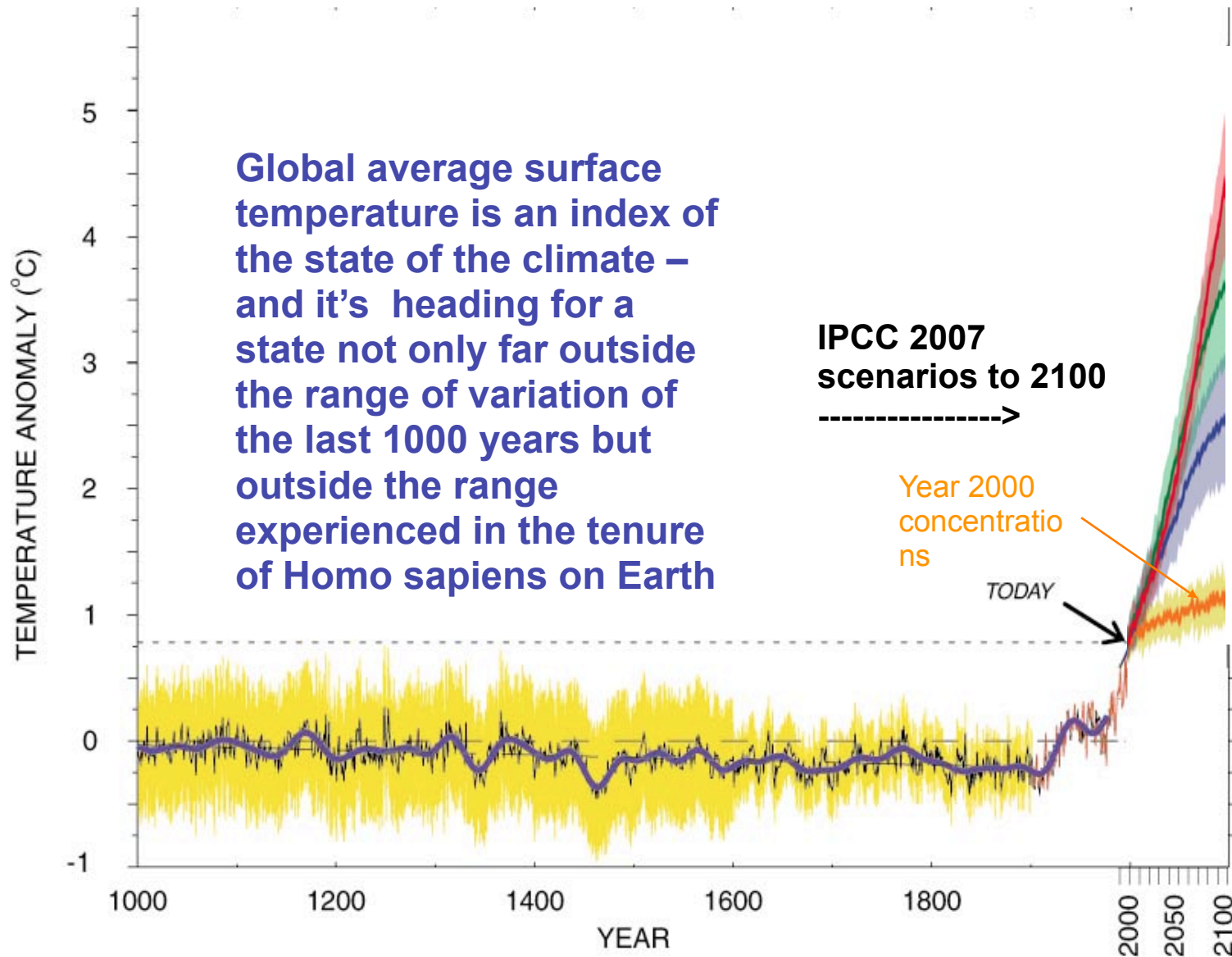
Attribution

**Our models
predict history
very well, so
we are
confident in
their ability to
project future
impacts**

Source: IPCC 4th Assessment (2007)

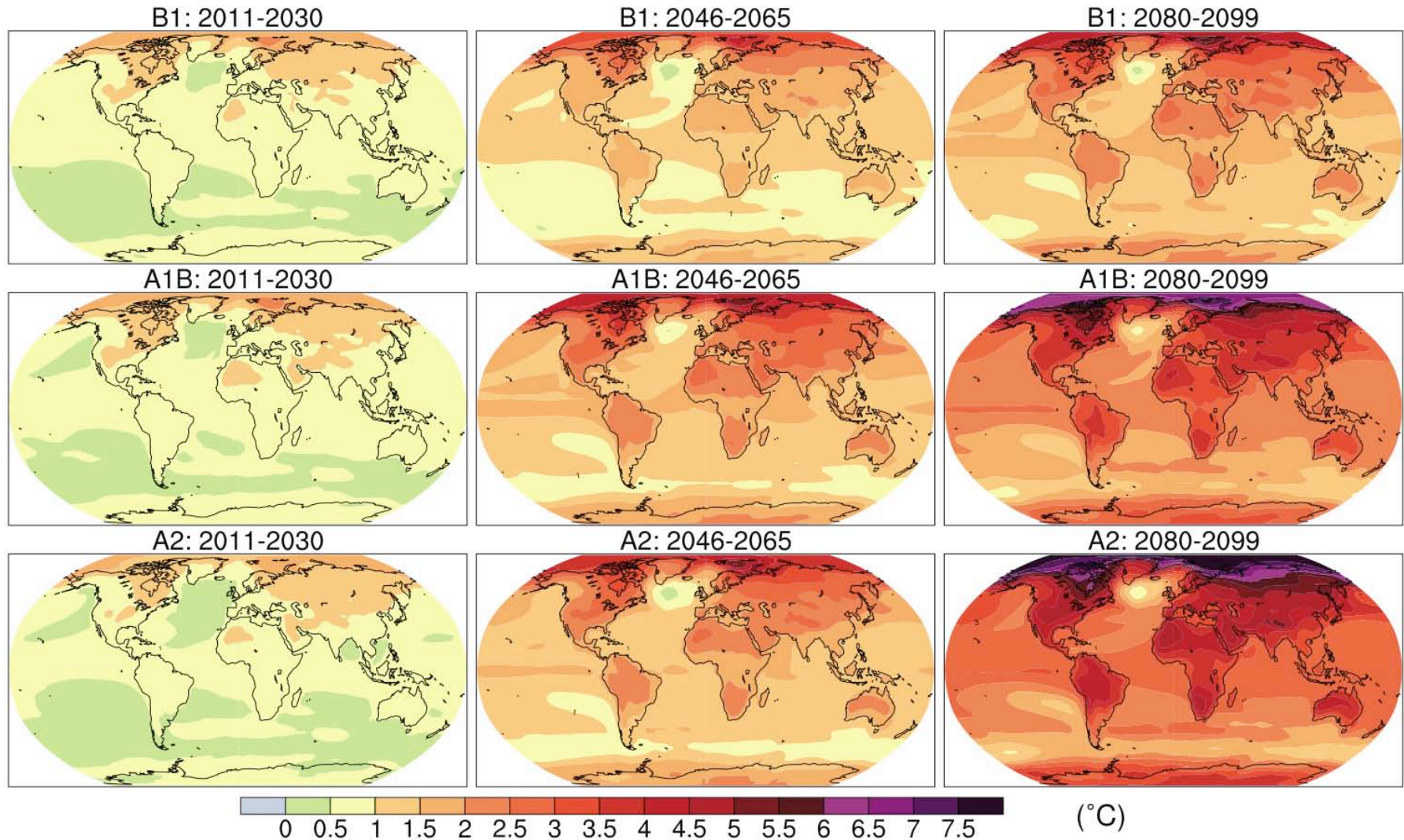


If we don't alter course, we'll end up where we're headed



Source: John Holdren, after IPCC

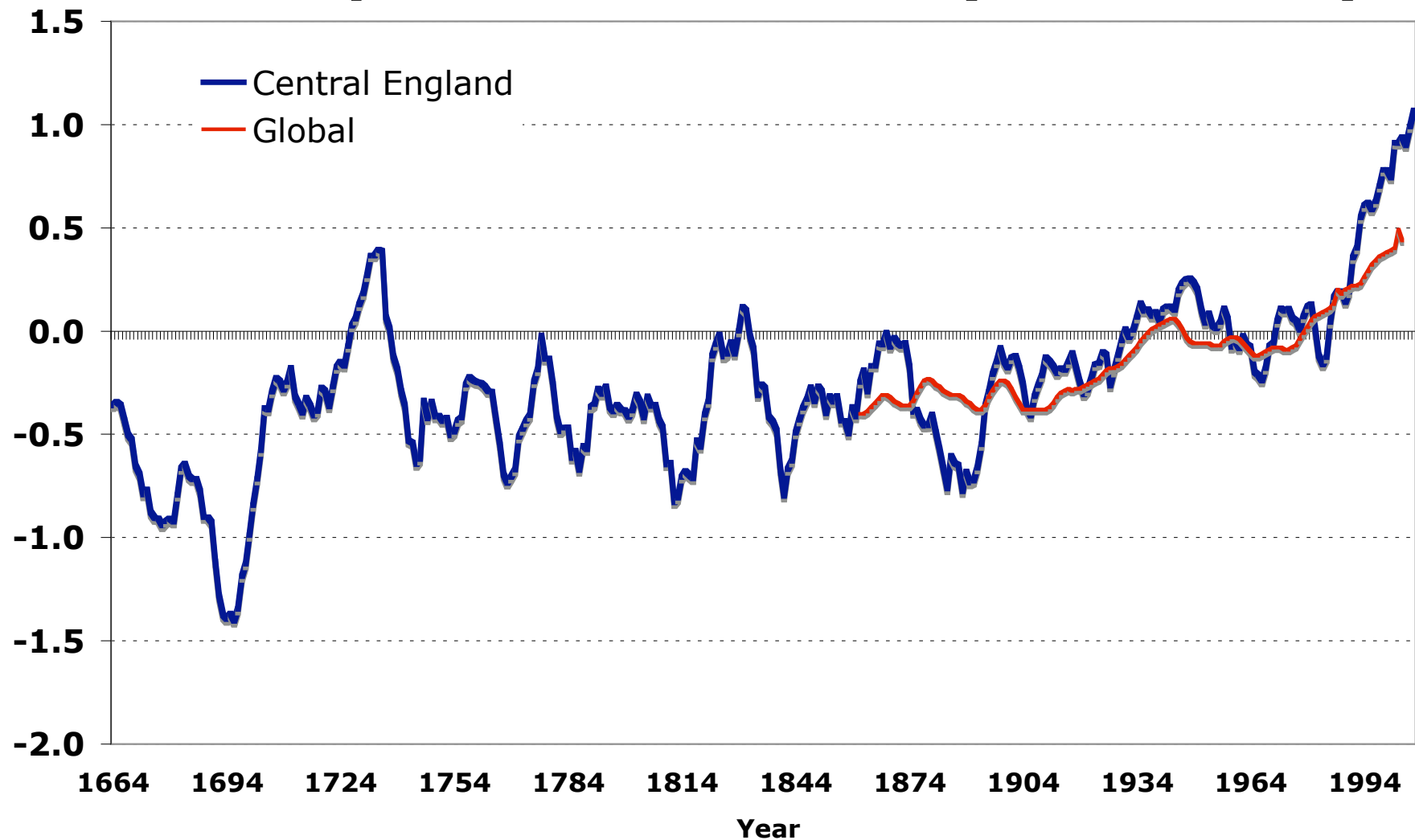
Looking Forward: Range of Predicted Warming



England: Warming

rees Celcius
viation from
l-1990 avg.)

Temperature Increase (1665-2007)

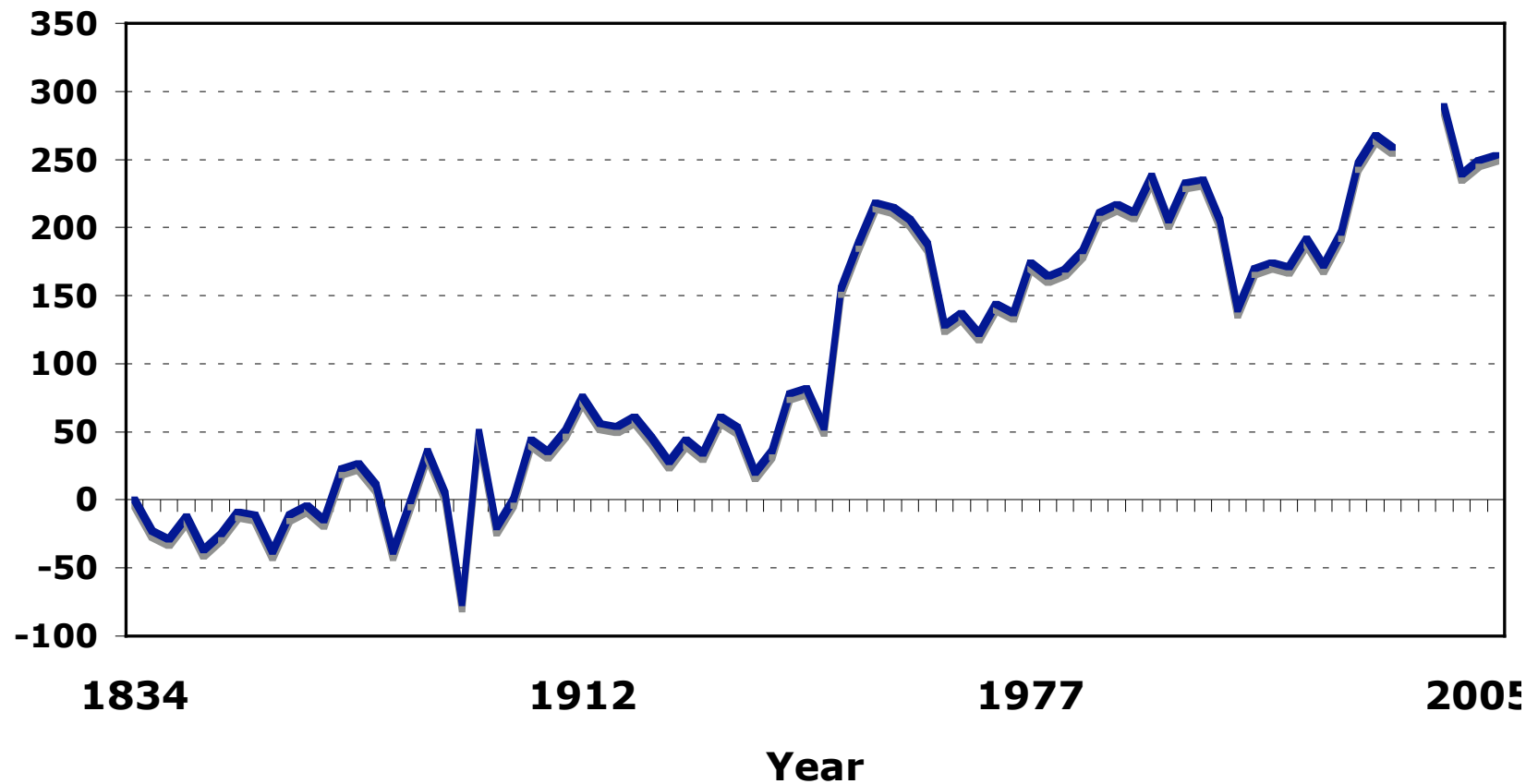


Source: Hadley Center - via UK Environment Agency

England: Sea-Level Rise

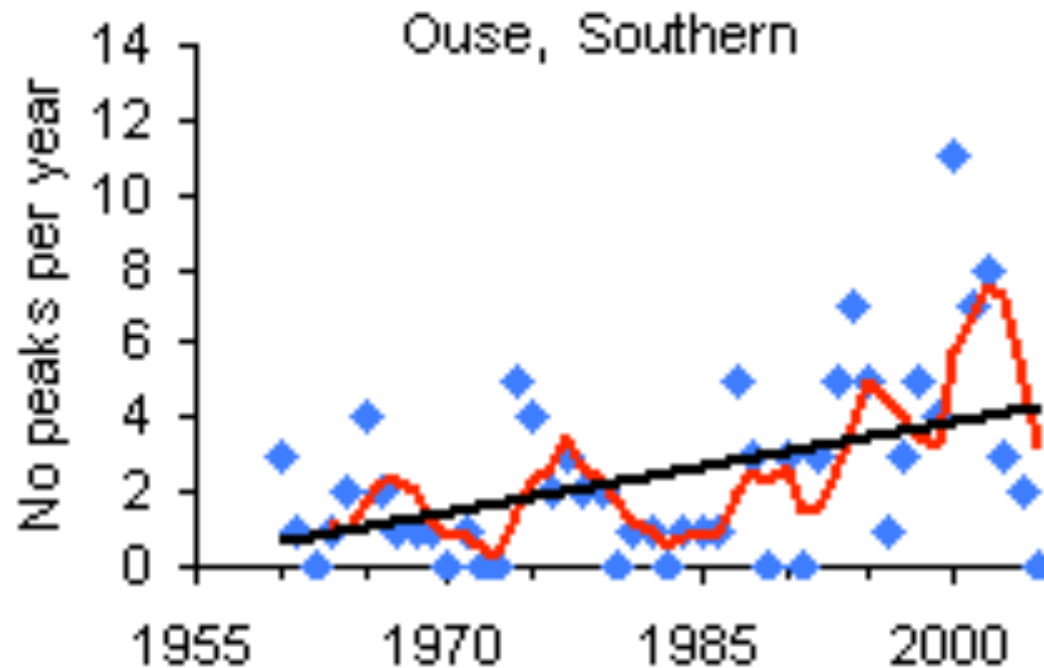
Sea-Level Rise: 1934-2006 (Sheerness)

Change from
initial value
(mm)



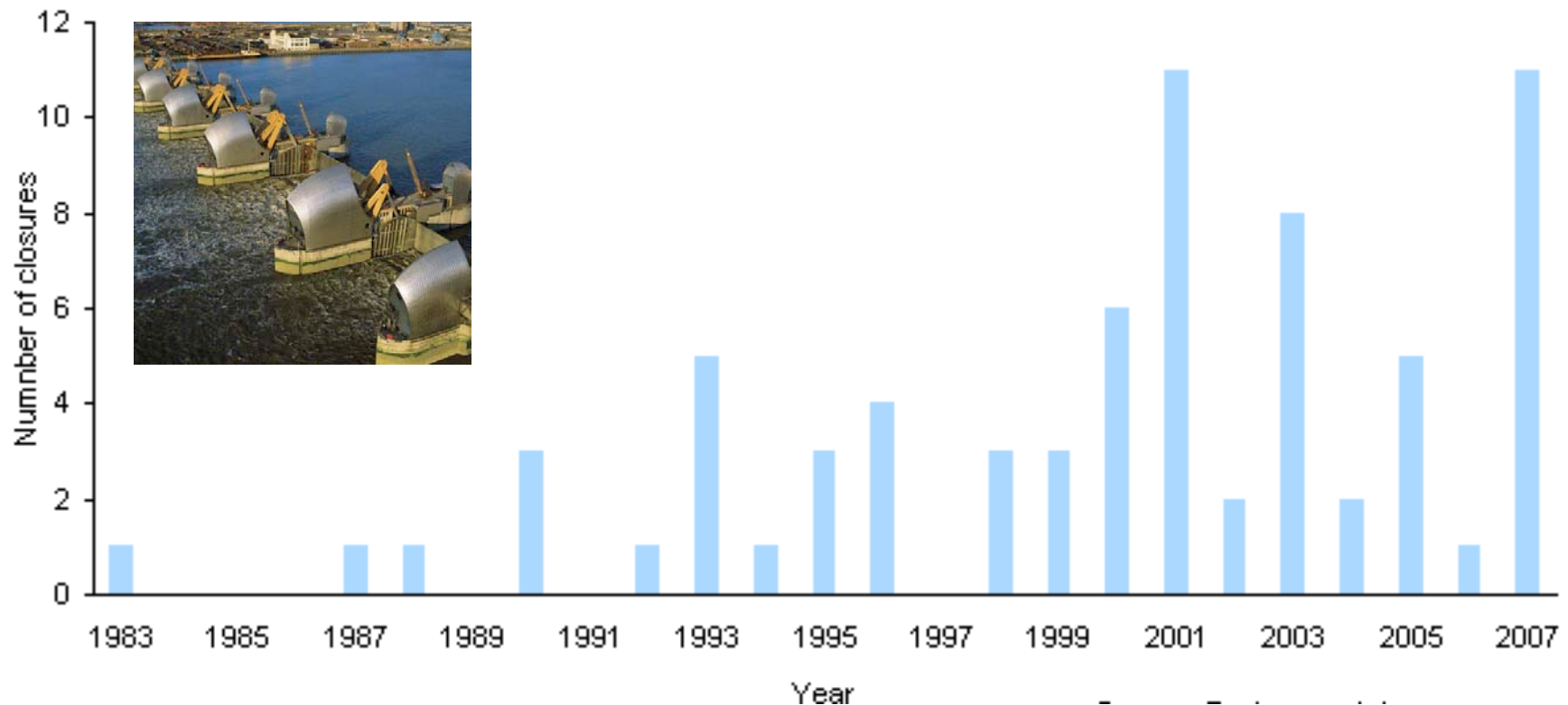
Source: UK Environment Agency

England: Flooding



Data show number of peaks compared to that exceed at least three times each year from 1981-2000 average

Thames Barrier Closures against Tidal Surges: 1983-2007



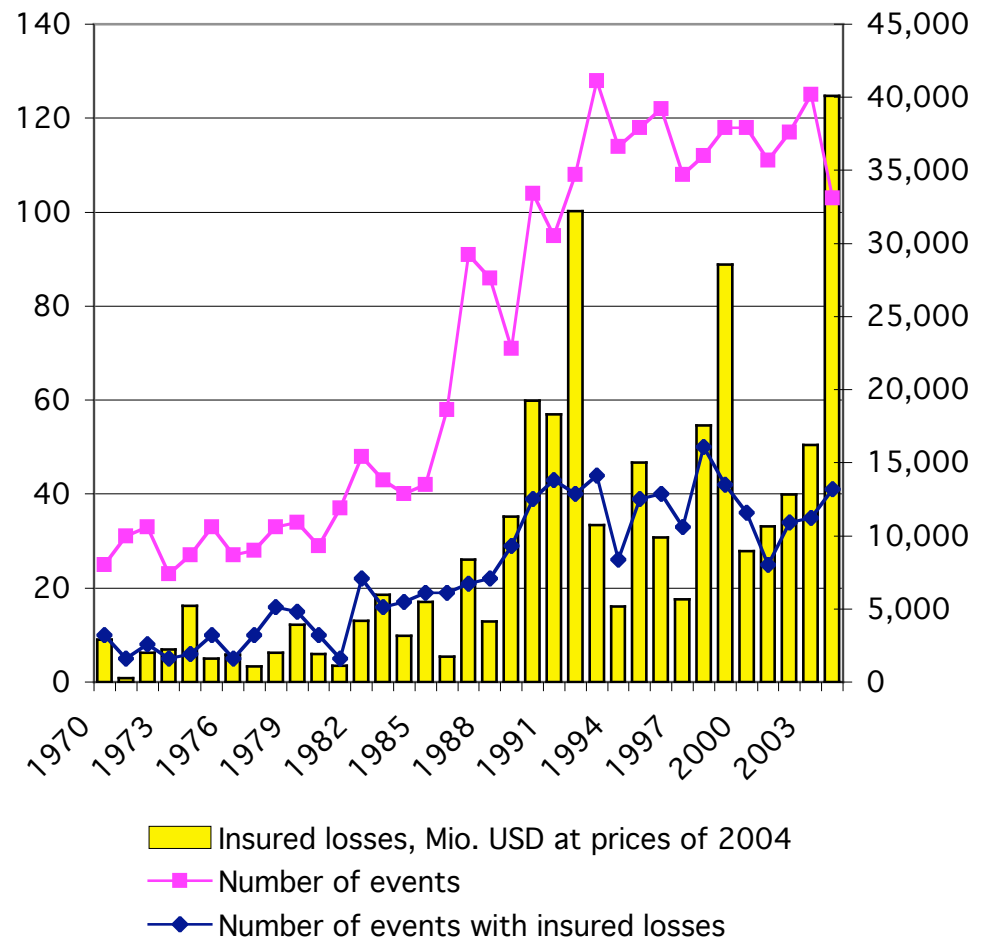
Source: UK Environment Agency

FINGERPRINTS ... Costs



- Demographics **plus** warming
- Number of events rising
- Trends *consistent* with observed change
- Non-weather losses growing more slowly
- Trend would be even steeper without prevention efforts

Weather related catastrophes:



Source: Swiss Re, Sigma Catastrophe Database

For Insurers, Climate Change is an Emerging Risk to be Managed...

Insurers are....

- messengers
- integrators
- risk assessors
- risk managers

but...

- vulnerable
- flying partly blind
- selective

and....

- part of the solution



Climate Change is #1 Risk, According to >70 Insurance Industry Analysts

(Ernst & Young Survey, March 2008)

- 1. *Climate change***
- 2. Demographic shifts in core markets**
- 3. Catastrophic events**
- 4. Emerging markets**
- 5. Regulatory intervention**
- 6. Channel distribution**
- 7. Integration of technology with operations and strategy**
- 8. Securities markets**
- 9. Legal risk**
- 10. Geopolitical or macro-economic shocks**

Anticipated Losses



Property

- Property damage
- Marine mishaps
- Mold/moisture
- Forest products
- Agricultural losses
- Fisheries
- Business interruption
- Roadway



Life/Health

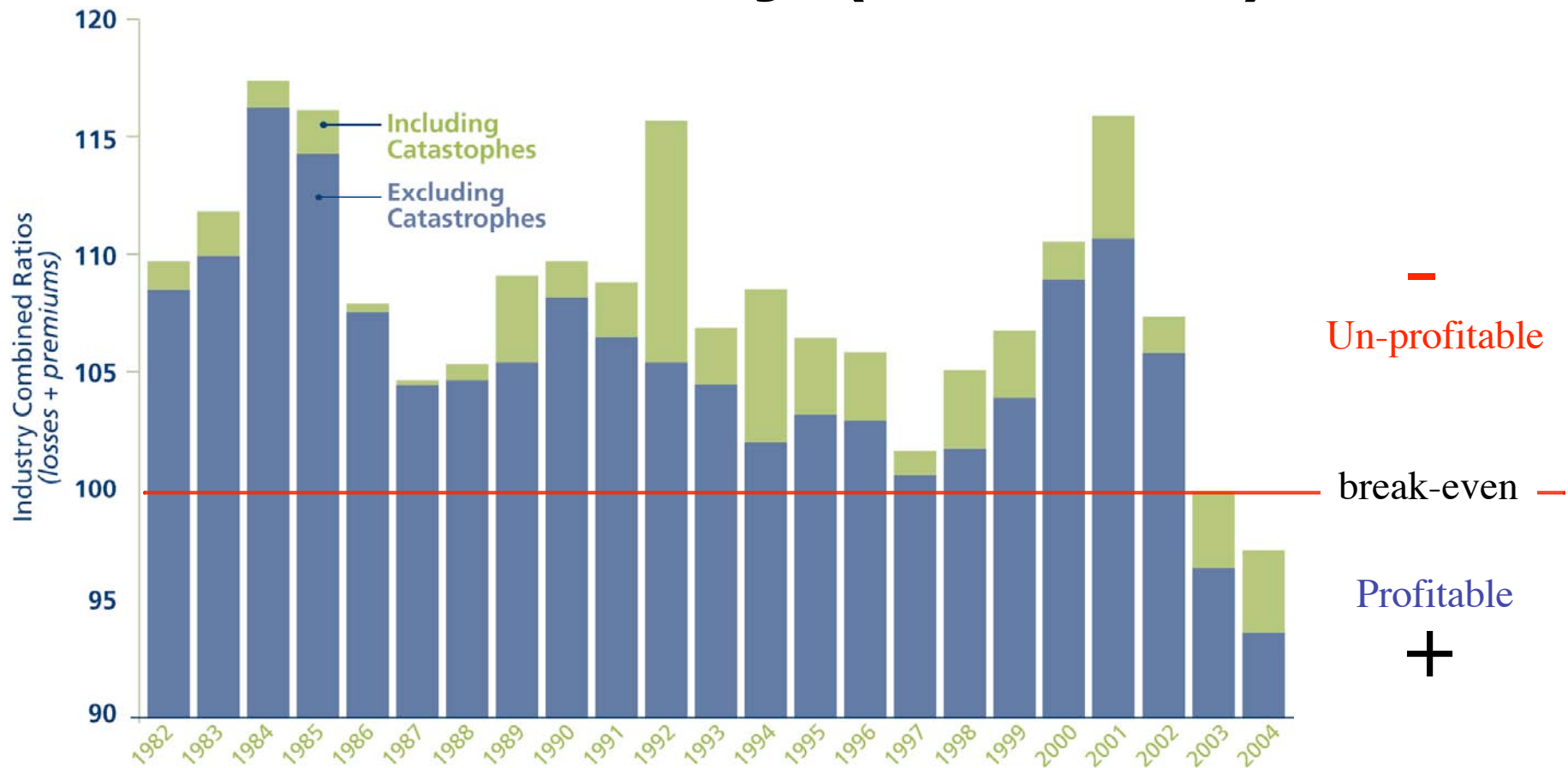
- Injury
- Infectious diseases
- Heat stress
- Respiratory
- Pollution release
- Food poisoning
- Mental health
- Nutrition/water



Liability (Casualty)

- Products
- Negligence
- Nuisance
- Fiduciary
- Tort / BI
- Environmental
- Roadway liability insurance

CATs Profoundly Influence Profitability (US P&C)

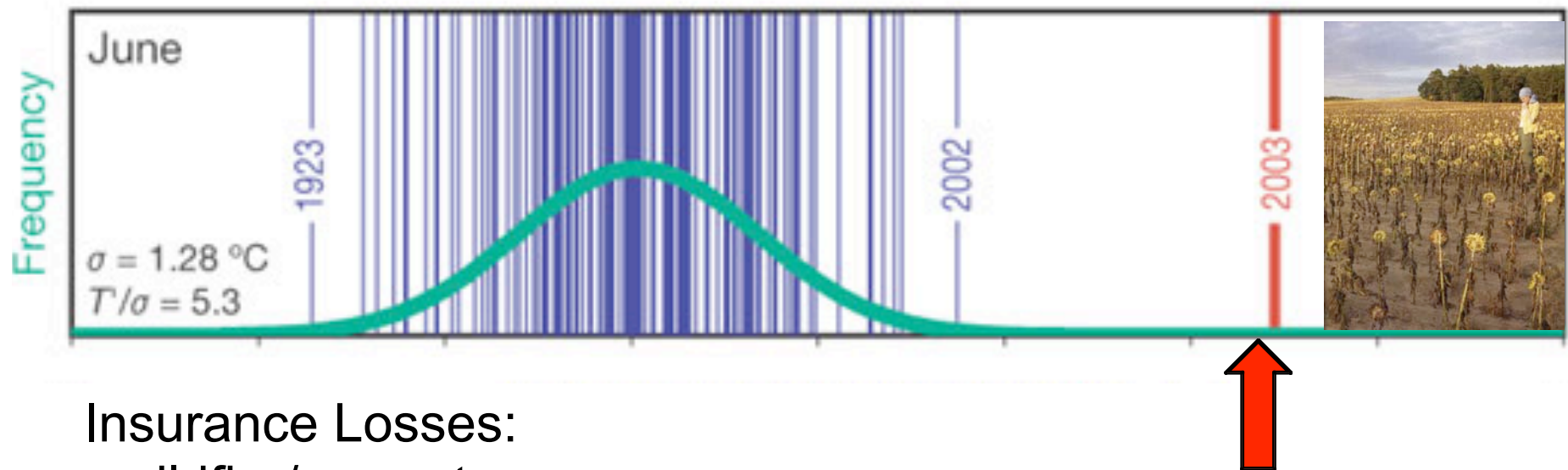


Note: CATs having increased influence on overall profitability

Source: A.M. Best & Co.

Rare Extremes Cause Most of the

The European heat wave of Summer 2003



Insurance Losses:

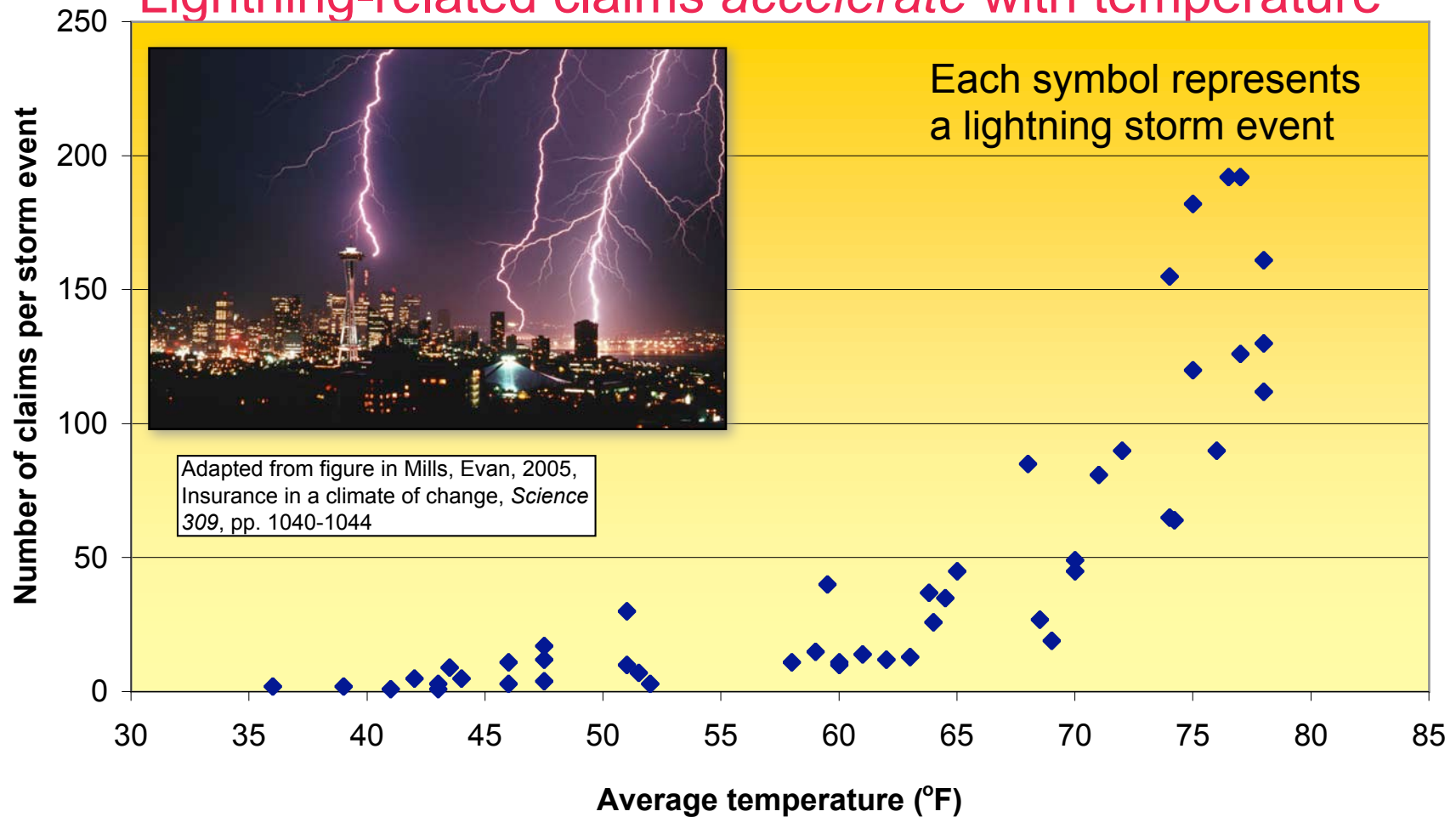
- wildfire/property
- crop
- power sales
- health/mortality

Event was “six-sigmas” outside of norm.
16°F above average in France and Germany
was a 1-in-10,000 event to 1-in-46,000 event

Source: Schar et al, *Nature*, v. 427, 2004.

Small-scale Losses: Lightning

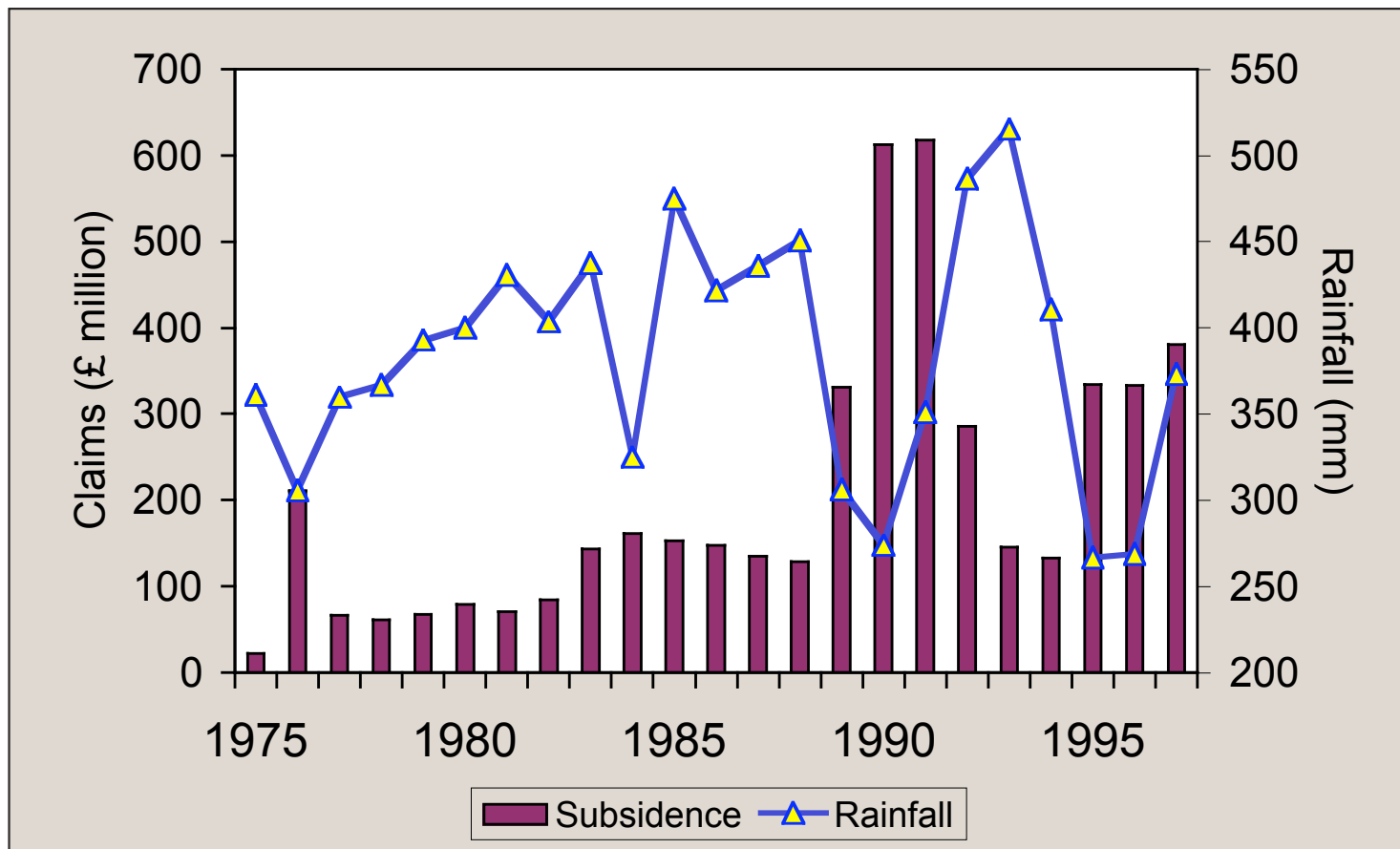
Lightning-related claims *accelerate* with temperature



Source: Hartford Steam Boiler Inspection and Insurance Co.

Small-scale Losses: Soil Subsidence

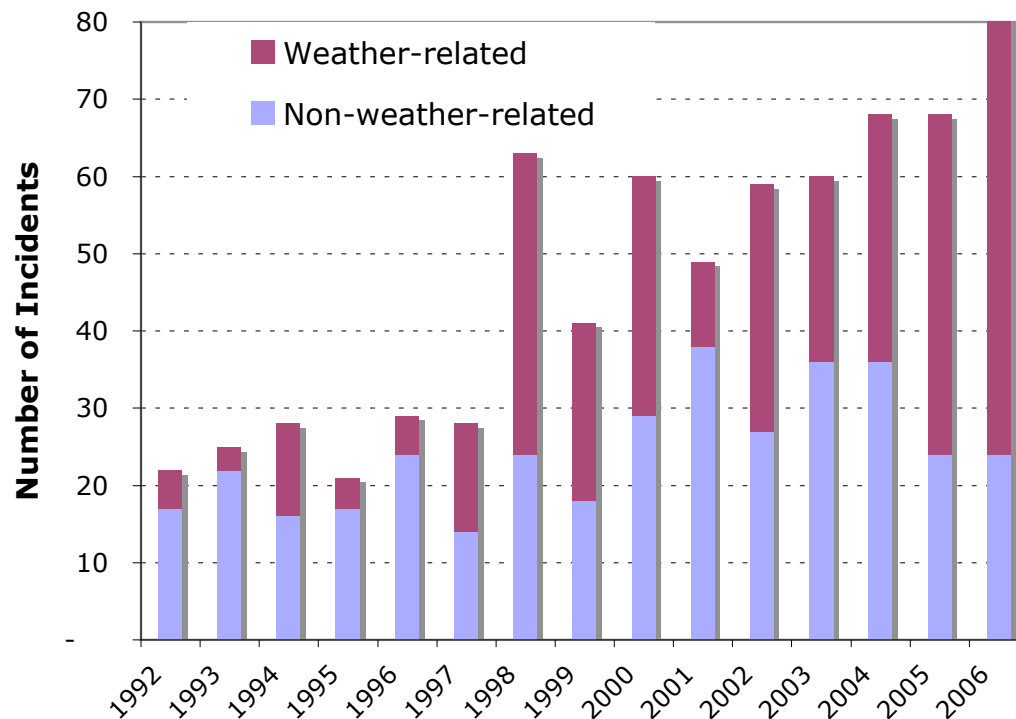
Subsidence claims increase with drought: UK 1975-1999



Source: Association of British Insurers

Small-scale Losses: Power Outages

US Electric Grid Disturbances (1992-2006)
Weather- and Non-Weather-Related
110 million customers effected



Source: US Department of Energy

**Power outages were a factor in slowness of draining
New Orleans following Hurricane Katrina.**



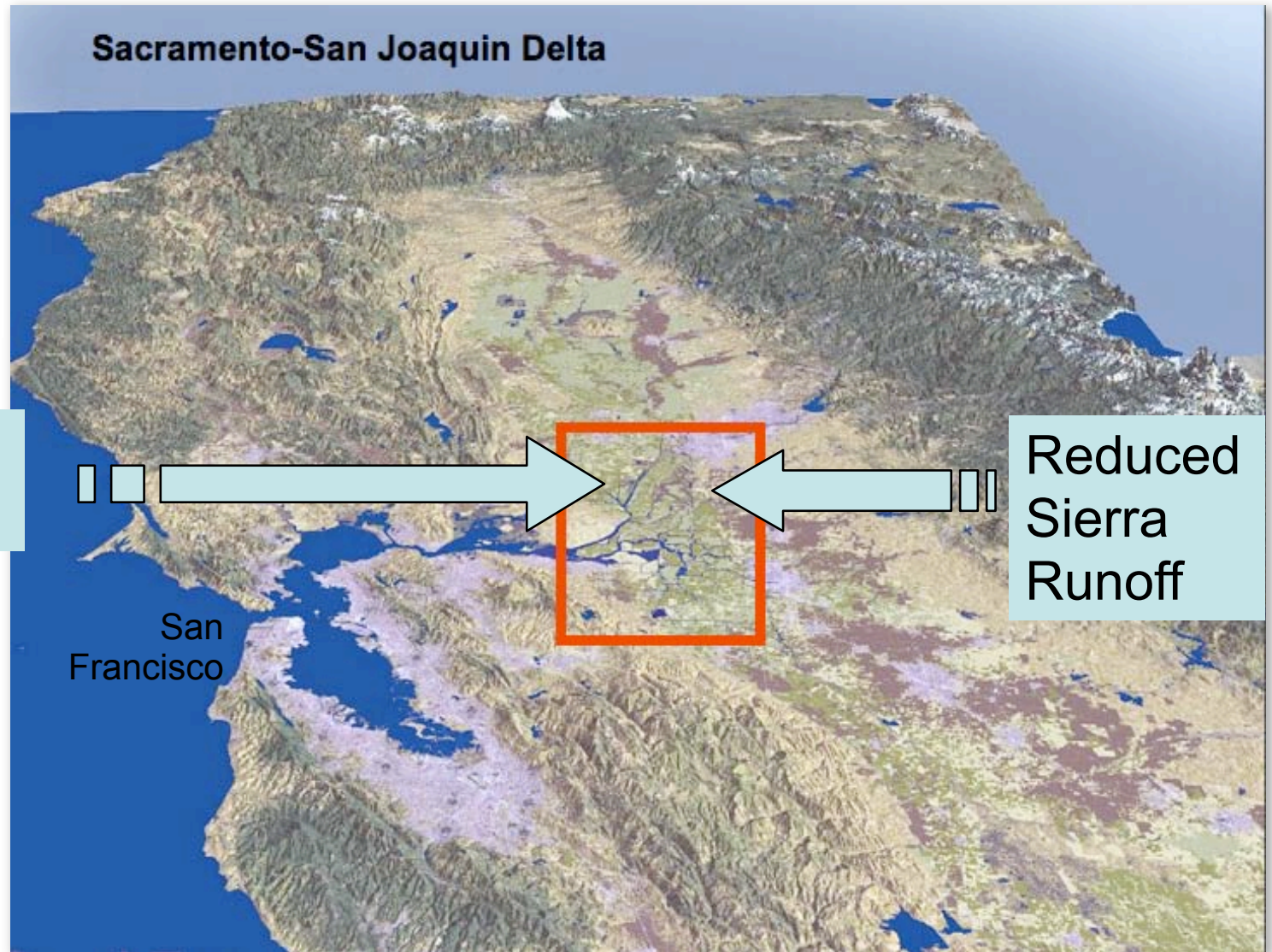
U.S. economy total cost: ~\$80B/year
**Average cost to utilities \$49 million/
storm; max. \$890 million (EEI)**
RMS Scenario:
\$2.7B for NY

Small-scale Losses: Floating Ice



Water Quality: California

CALIFORNIA
www.50states.com



Sea-level
Rise

Reduced
Sierra
Runoff

Emerging Risk: Liability

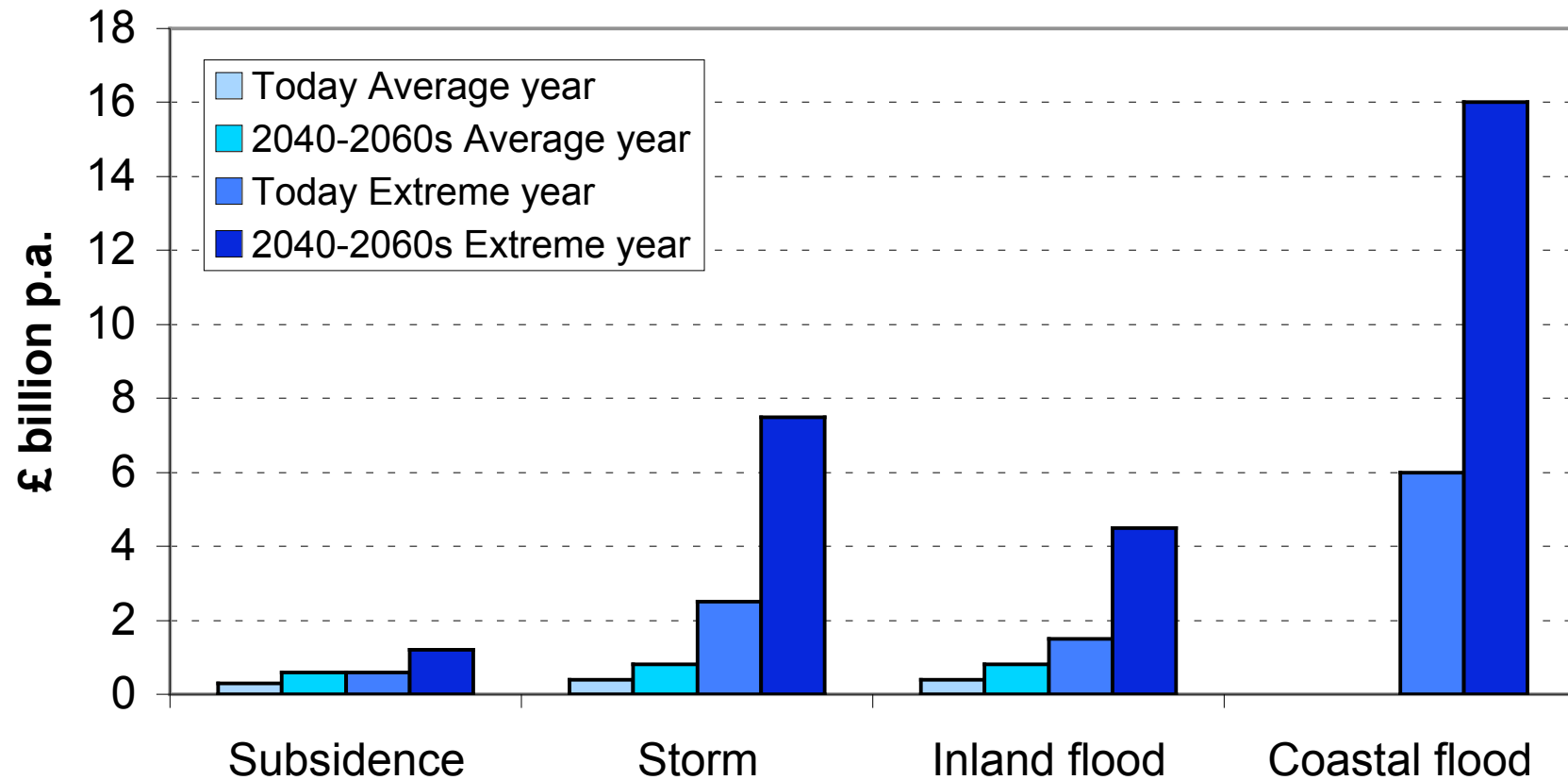


Oil spill following Hurricane Katrina



> 30 climate law suits pending as of 1/2008

Projections of UK Insured Losses



Source: Association of British Insurers, "Adapting to Our Changing Climate: A Manifesto For Business, Government, and the Public"

Risks Are Also Associated with Responses to Climate Change



- Green buildings
- Nuclear power
- Renewable energy
- Hydrogen
- Carbon capture & storage
- Carbon offsets/trading
- Geo-engineering
- Adaptation projects

*Comparative risk
assessments needed*

Summary: Reasons for Concern

- Actuarial
 - variability
 - correlations
 - non-linearities
 - data “blind-spots”
 - models
- Contraction
- Competition
- Regulation
- Reputation
- Assets & share prices
- Own liability
- Macro-economy: higher energy prices, conflict ...
- ***Insurability***



“We'd be out of our minds if we wrote weather insurance on the opinion global warming would have no effect at all.”

**Warren Buffett
2006 annual Shareholder meeting**

“Radical changes in natural catastrophe frequency and/or severity could eliminate certain of our markets through physical damage, price escalation, or regulatory activity... unpredictability could negate the use of actuarial techniques and undermine our ability to price and risk-manage product offerings.”

ACE Limited response to the fifth annual Carbon Disclosure Project questionnaire

European Insurance & Reinsurance Federation

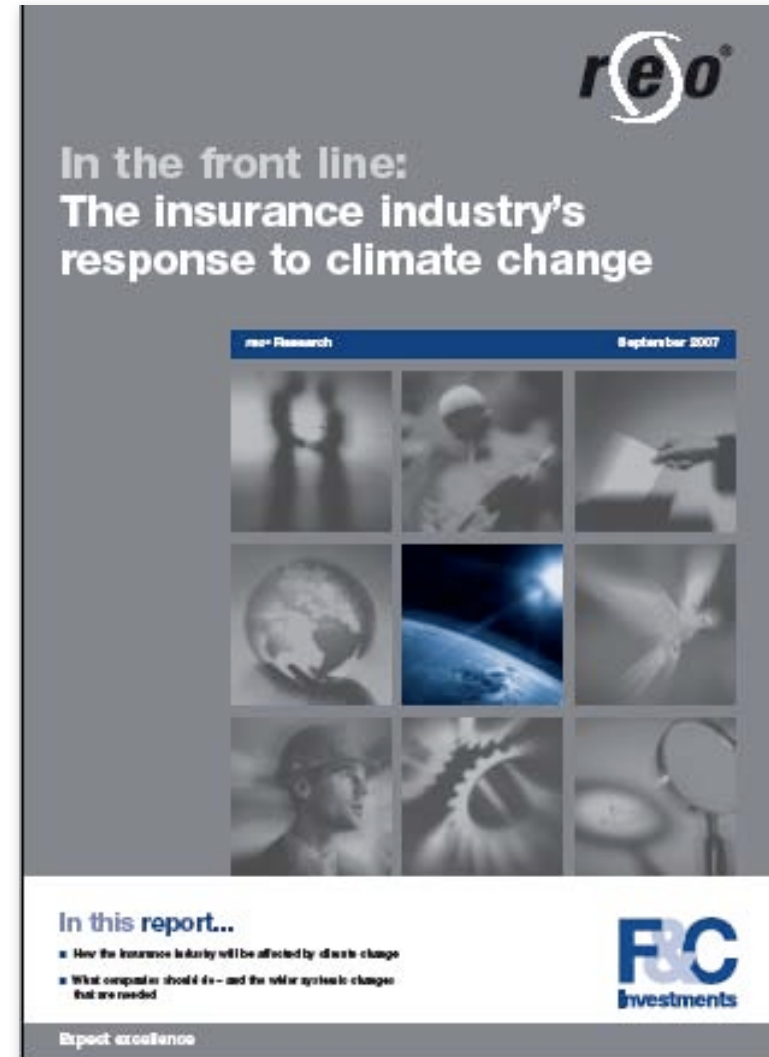
(July 2007)

- Includes 33 insurance associations, representing 94% of premiums in region
- Strong concern about climate change, and need for proactive steps

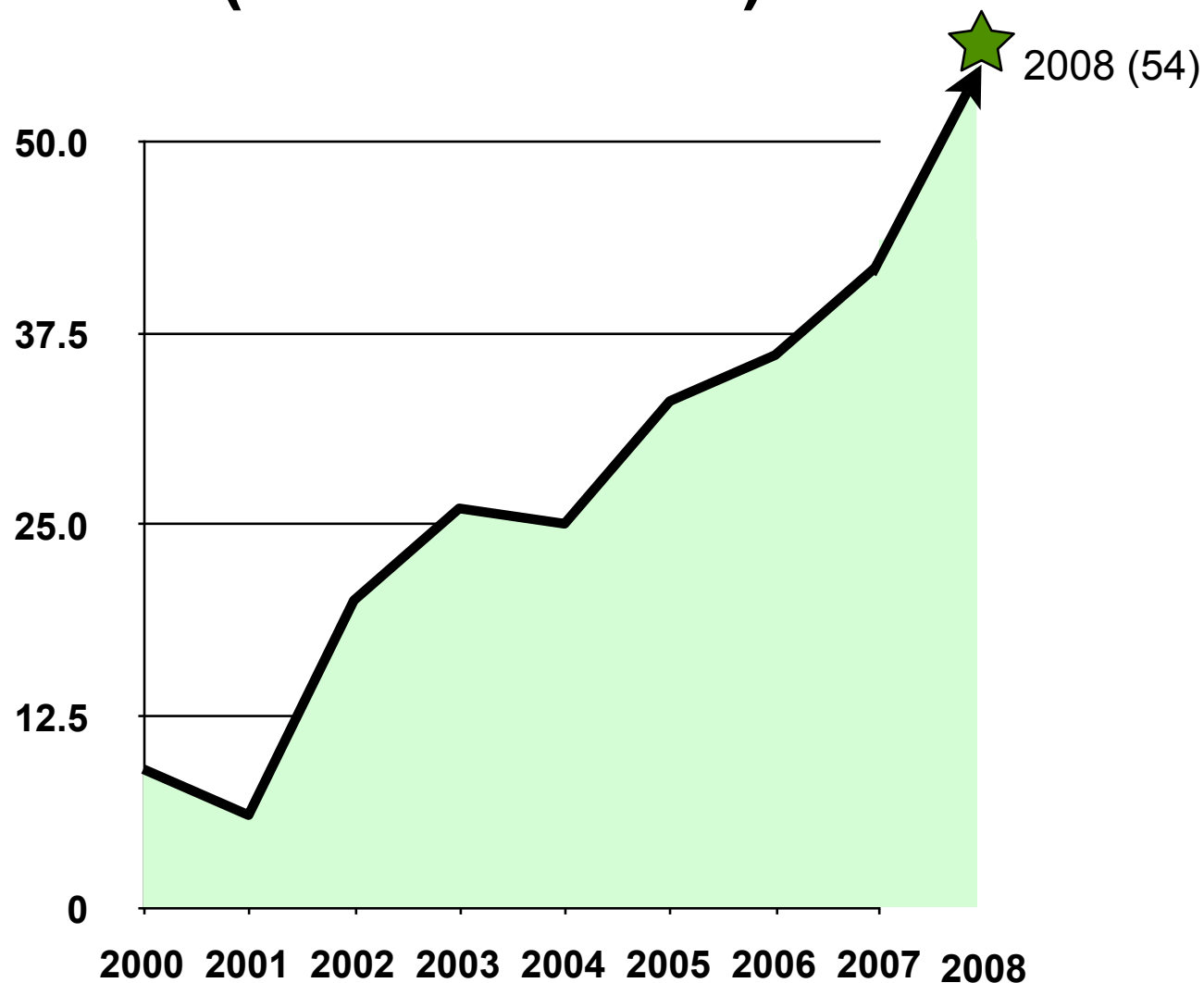


F&C Investments Statement: September 2007

- F&C is asset manager with \$200 billion under management
- Concerned about climate-sensitivity of their investments in insurers



Shareholder Climate Resolutions (United States)



2000-2006 Data: ISS 2007

2007 Data (as of 02.06.07): Ceres 2007& 2008

Insurance Regulators (via NAIC Task Force) Recognize the Problem

“Global warming is upon us, and it poses unprecedented new threats to the insurance industry and vast segments of society that rely on insurance for peace of mind and financial security.”

**Michael Kreidler
Washington Insurance Commissioner**

**Tim Wagner
Nebraska Insurance Commissioner**

Energy Industry Responds

“Most scientists believe that greenhouse gas emissions from human activities are influencing the earth’s climate. Duke Energy shares that view.”

“... Congress needs to establish a national, economy-wide greenhouse gas mandatory program as soon as possible.”

**Duke Energy (CEO Jim Rogers)
Corporate website as of March 2, 2008**

Insurance Paradigm Shift

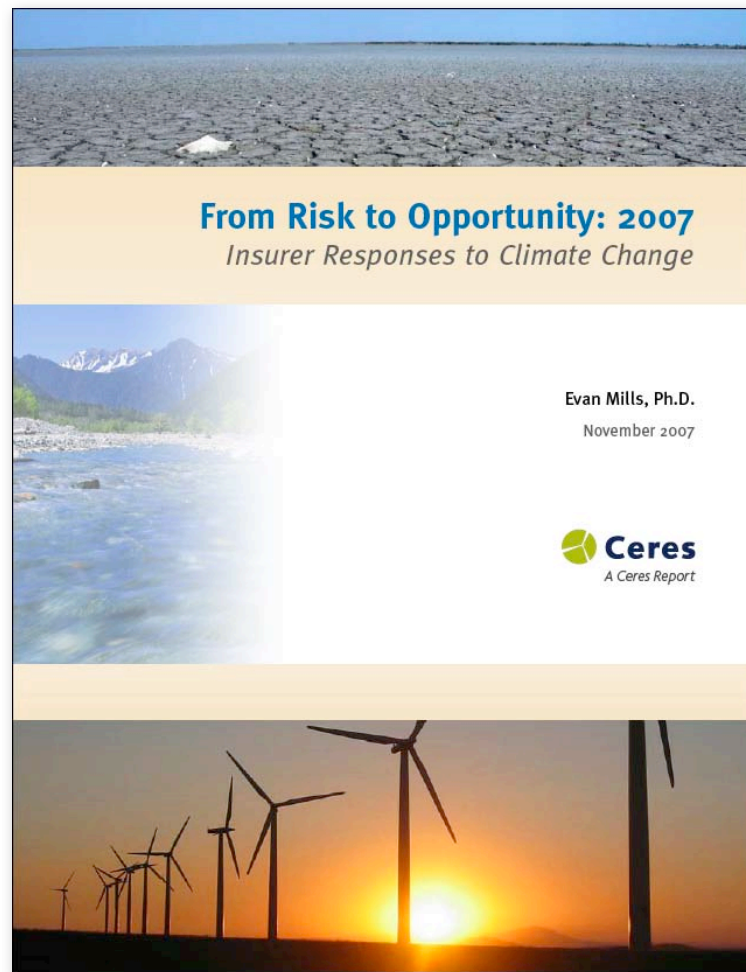


“AIG sees opportunities to improve the environment, protect customers and reward shareholders by developing products and investing in technologies that can mitigate the risk and effect of climate change.”

**Martin Sullivan, CEO, AIG
2007 Annual Letter to Shareholders**

From Risk ... to Opportunity

**30 strategies; 422 examples
~190 parties; 26 countries ... and counting**



More Business!

**Global Renewable Energy Investments:
\$85 Billion in 2007**



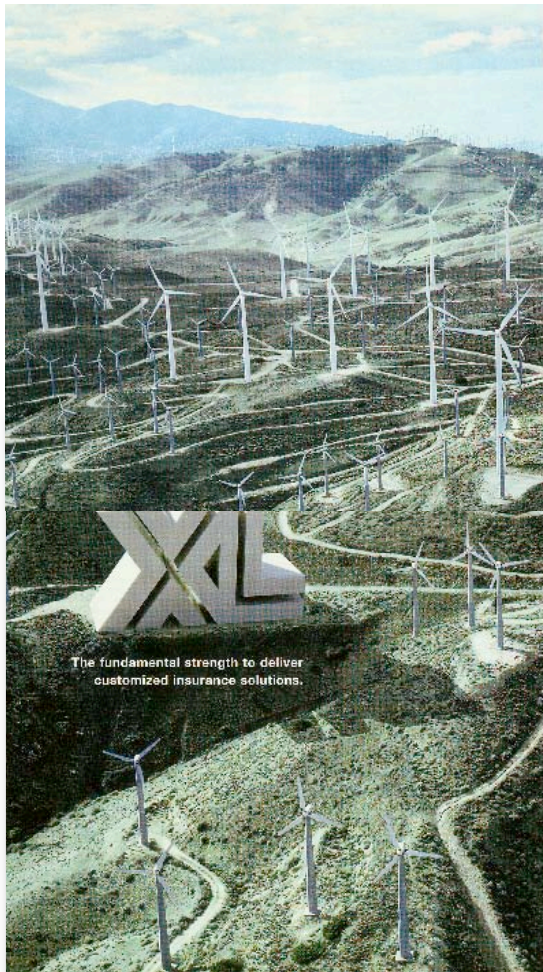
The strength, experience and flexibility
to protect business against risk.

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depth of our experience, but also for the
quality and variety of our products.

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& Business Interruption | Energy &
Construction All Risk | Fine Art |
Crisis to Thrill

CASUALTY
Bodily Injury | Global Public
& Products Liability | Automobile
Liability | Umbrella & Excess Liability

PROFESSIONAL
Directors & Officers | Employment
Practices Liability | Errors & Omissions

SPECIALTY
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Liability | Marine & Marine
Cargo | Programs

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New Insurer Business Units



“Office of Environment & Climate Change”;
“Advanced Energy Solutions”



“Climate Solutions”



“Agri-Fuels Group”



“Green Energy Team”



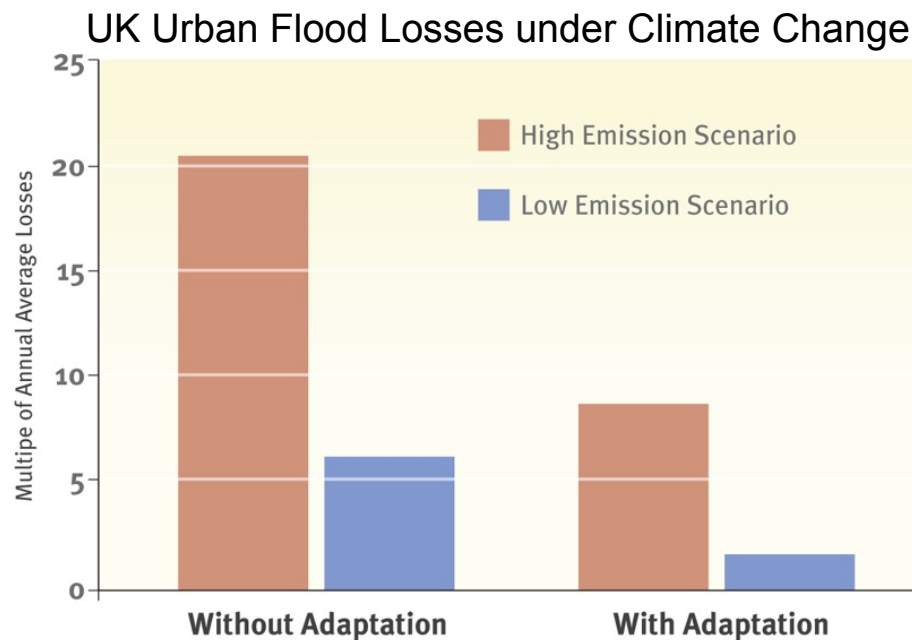
“Core Business Climate Change Project”



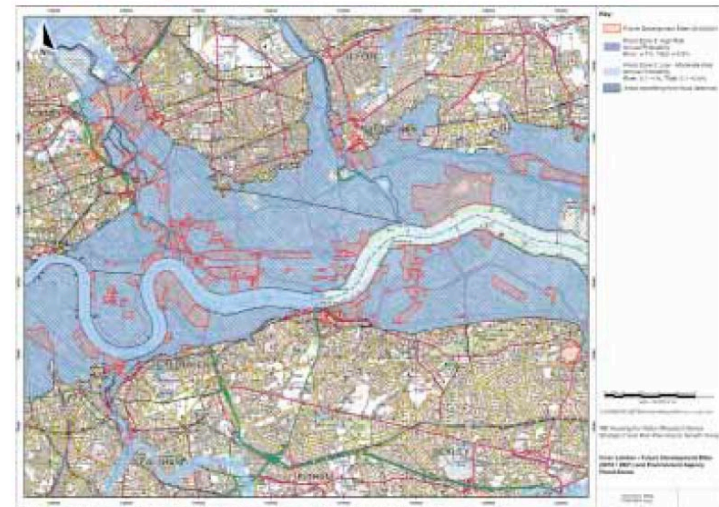
“Climate Change Advisory Council”

Understanding Climate Change: Land-use Planning

Association of British Insurers - modeling studies



e. Thames Gateway - East London



CEA Report: 13 of 18 countries have >10% penetration of commercial flood insurance

Source: Modeling results for London. Adapted from Association of British Insurers, "Financial Risks of Climate Change" c: 2080s

Understanding the Climate Change Problem: Modeling

- *Modeling efforts underway:*

- *III*

- *AIG*

- *Lloyds*

- *Munich Re*

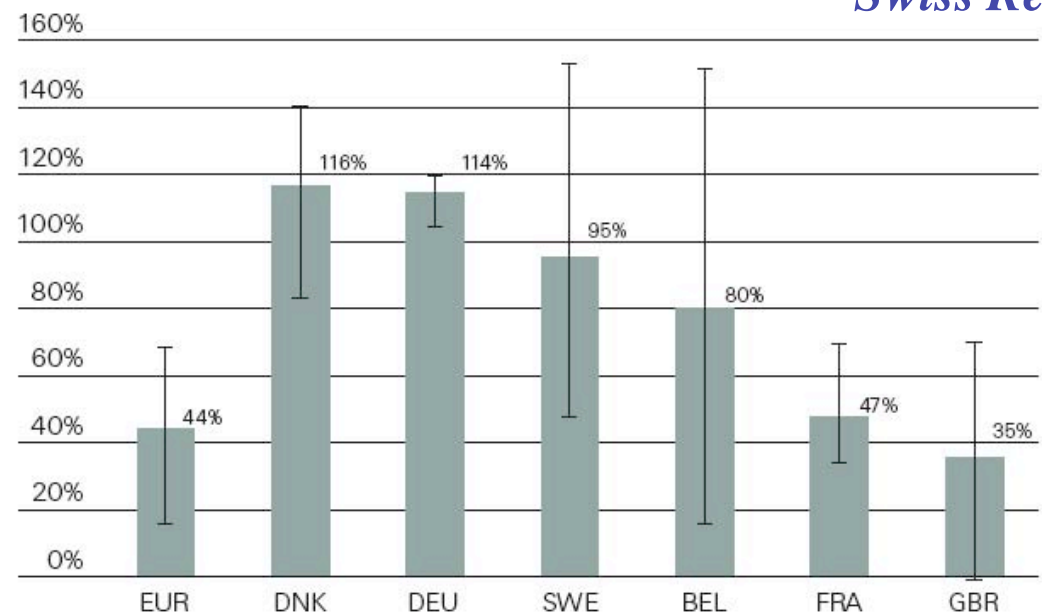
- *Swiss Re*

- *Willis*

- *RMS*

Expected increase in annual windstorm loss in Europe

Swiss Re



Increase in annual expected loss for Europe (EUR), Denmark (DNK), Germany (DEU), Sweden (SWE), Belgium (BEL), France (FRA) and the UK (GBR) over the period 1975 to 2085 (in %). The broad bars represent the mean value of the climatic models, and the error bars show the spread of the results from all models

Promoting Loss Prevention: Building Design

- *Institute for Business and Home Safety's* “Fortified... for safer living” stds.
 - Wind-resistant rigid foam panel walls and multi-glazed windows
 - Ice-dam resistant
 - Mold resistant
 - Water-resistant insulation



BASF Home - Patterson NJ

Some insurers giving premium credits for compliant homes

Promoting Loss Prevention: Wetlands Restoration

- *Tokio Marine Nichido*: has reforested 12,200 acres of mangroves in Indonesia, Thailand, Philippines, Myanmar and Vietnam



Company states that 2005 Tsunami did less damage in these areas

Source: <http://www.tokiomarine-nichido.co.jp/english/index.html>

Aligning Terms & Conditions with Risk-reducing Behavior

- Insurance discounts of up to 40%

- *GMAC*
- *Progressive*
- *Norwich Union*
- *Polis Direct*
- *Rheinland*
- *Versicherungen*
- *Aioi*
- *Axa*
- *Hollard*
- *Gerling*
- *Unigard*
- *Sompo and Tokio Marine & Nichido*

250,000 policies
in Europe as of
2007;
\$700M
revenues
projected by
2010




General Motors Acceptance Corporation
(GMAC) PAYD discount schedule.

Miles/year	Discount offered
1 – 2,500 miles	40%
2,501 – 5,000	33%
5,001 – 7,500	28%
7,501 – 10,000	20%
10,001 – 12,500	11%
12,501 – 15,000	5%
15,001 – 99,999	0%

*Some use GPS --> stolen-vehicle
recovery; avoids reporting fraud*

Aligning Terms & Conditions with Risk-reducing Behavior

- **Travelers, Farmers, Berkshire/GEICO, AXA, Cooperative, Desjardins General:** offer 5-10% premium discounts to drivers of hybrids
- **Swiss Re:** seeking D&O disclosure from insureds



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And fossil insurance policies.**

It's just what the insurance world needs—more blue sky thinking. At Travelers, we're always working to identify changes in the world and to make sure your policies stay in-synch. From the discount we offer forward-thinking hybrid drivers to our monitoring of new risks, we help insurance keep up with life—whatever the road ahead may bring. Call an independent agent. After all, your world is always evolving. So should your insurance.

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Win-Win Solutions

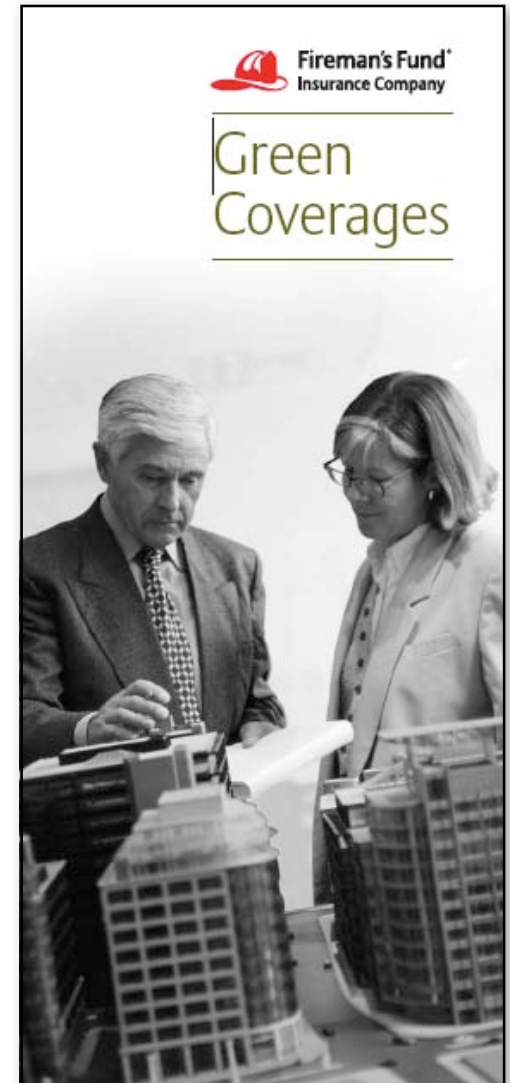
- *Arkwright Mutual (now part of FM Global):*
replaced fire-hazardous halogen “torchieres” with compact fluorescent alternatives at Northeastern University student housing + seminars for risk managers

Collaboration with Boston Edison and LBNL



Innovative Products

- **Fireman's Fund:** first-ever U.S. *commercial* "Green-Buildings Insurance"
 - 5% premium credits for existing green features
 - Rebuild to LEED after loss
 - ~500 policies sold in first year (2007)
 - Premiums > \$35M in '07; Doubling quarterly
- **AIG (Lexington):** Commercial, and first-ever U.S. *residential* "Green-Buildings" insurance being launched this year
 - Rebuilding to LEED (or next-higher LEED level) after loss; LEED design and registration fees
 - Rewards use of EnergyStar-labeled equipment
 - Low-emission materials; IAQ testing
 - Solar "revenue loss" if downtime
- **AIG Environmental:** Sustain-a-Build *environmental liability* premium credit for green commercial buildings



Innovative Products

- ***Energy Production:***
Munich Re - geothermal,
Sompo - wind, others....
- ***Demand reduction:***
AIQ, Zurich and
others...



Innovative Products

- *Allianz, AXA, Cooperative:*
Car and travel insurance bundled with carbon offsets

The screenshot shows the CIS Cooperative Insurance website. The header includes the CIS logo and the tagline "For insurance, savings, investments and pensions". A navigation bar contains "My Portfolio" and "Get A Quote" with a dropdown menu currently set to "Motor Insurance". The left sidebar lists various services: Homepage, Motor & Home, ecoinsurance, Saving & Investing, Pensions, Life & Health, Banking, Mortgages, About Us, Ethics in Action, and Contact Us. The main content area is titled "ecoinsurance" and features a graphic of a car made of green grass. Below the graphic, it states: "Offset 20% of your car's CO₂ emissions*" and "ecoinsurance is the UK's first car insurance policy to help offset some of the damage your car's CO₂ emissions cause to the environment."

The screenshot shows the Climatesure website. The header includes the Climatesure logo and the tagline "insuring a brighter future". A navigation bar contains links: great insurance cover, great price, how it works, our partners, news, and home. The main content area is titled "great insurance cover" and includes a section for "Travel Insurance Cover". It lists several benefits: "Full CO₂ offset of all estimated carbon dioxide based on the air travel involved in the insured trip up to a maximum of 40 flight hours per policy", "A choice of single trip cover, annual multi-trip cover and backpacker cover", "Up to £7,500,000 medical coverage including a 24 hour emergency assistance helpline", "Up to £3,000 cancellation and curtailment", "Up to £2,000 baggage coverage", and "Free coverage for a range of leisure activities (and an option to upgrade cover for more dangerous ones)". A sidebar on the right contains a search bar and a "travel" button.

The logo features the Allianz logo at the top. Below it, the text "CO₂-neutral und effizient" is displayed. Underneath, it says "Ausstoß unter 140 g CO₂/km". The year "2008" is prominently shown, followed by the WWF logo and the text "In Kooperation mit dem WWF".

Coverage for Under-served Market Segments

- *Lockton Risk Services:*
 - group liability coverage for home energy auditors, if members of RESNET



Source: <http://www.locktonaffinity.com/RESNET/>

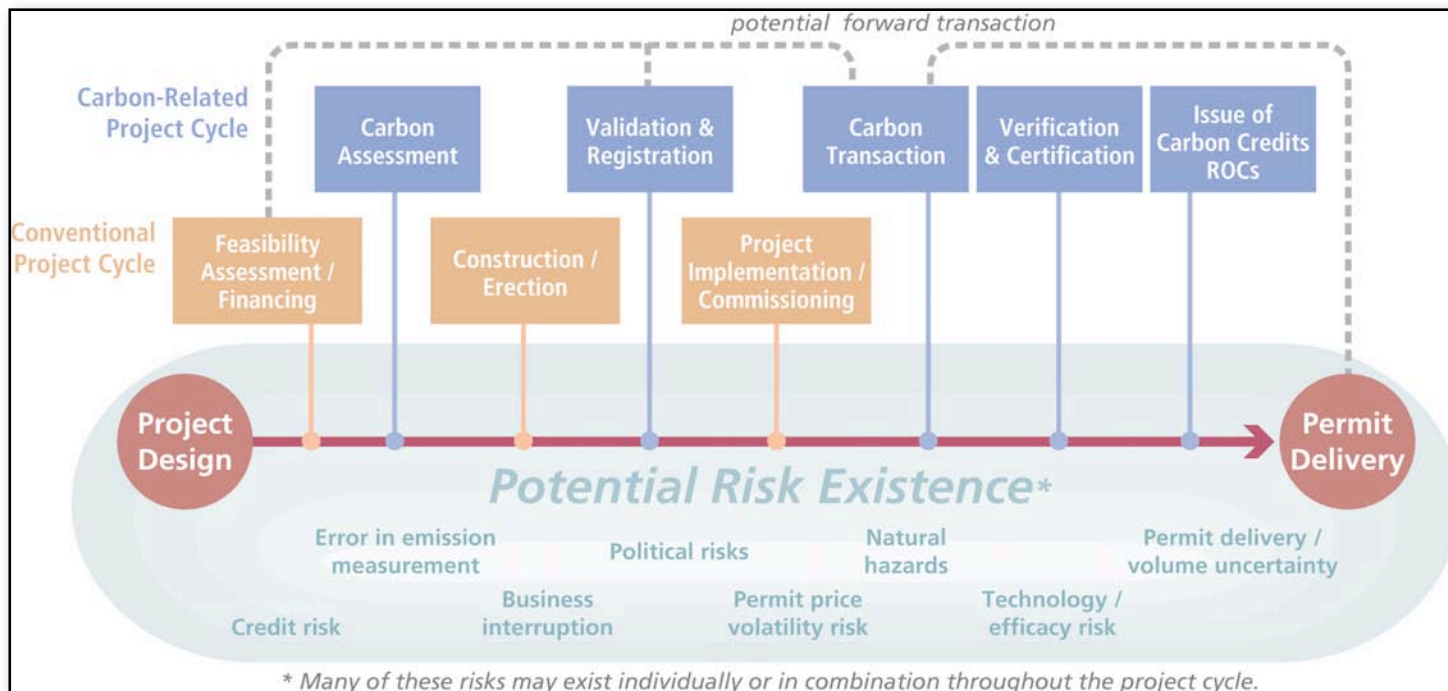
Coverage for Under-served Market Segments

- **Swiss Re:** Drought/Crop micro-insurance for 400,000 farmers in Ethiopia, Ghana, Kenya, Malawi, Mali, Nigeria, Rwanda, Senegal, Tanzania and Uganda.



Carbon Risk-Management Services: Project Risk

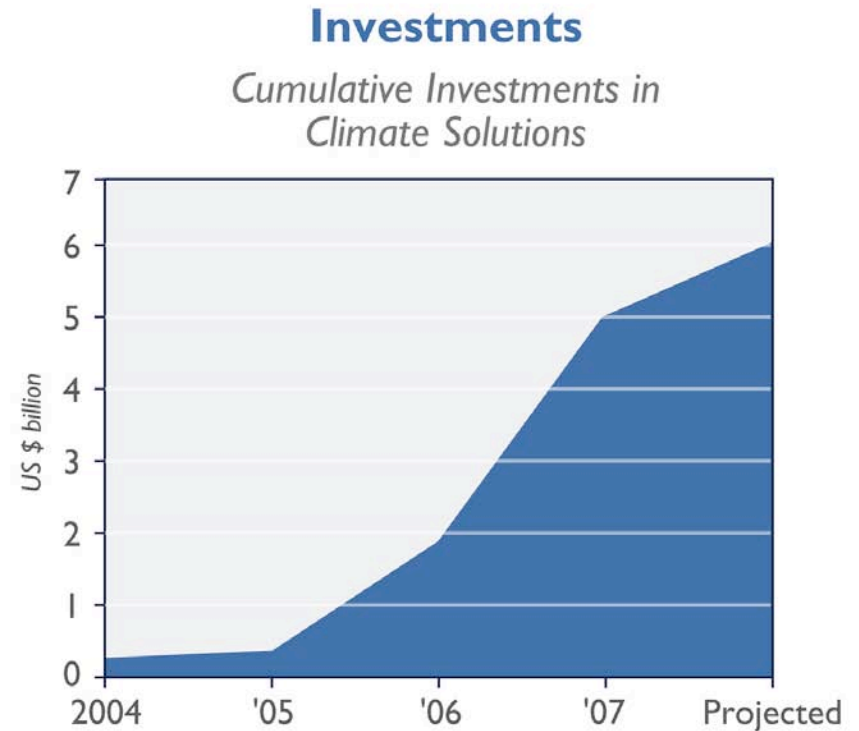
- **AIG, Marsh, others:** offering carbon project risk-management consulting services; insurance



Source: Marsh. 2004. "Responding to Climate Change Risks and Opportunities."

Direct Investment

- **Allianz:** \$15 million in the European Carbon Fund; plans to invest between \$400 and \$650 million in renewable energy
- **Gerling:** Sustainable Development Project operates a \$100 million venture capital fund
- **ING:** Green finance - \$1.16 billion
- **Sompo Japan:** \$100 million green fund
- **Swiss Re:** \$429 million “clean energy” venture fund; \$320 million in individual investments



2008 CERA study predicts \$7 trillion investment in “clean-energy technologies”.

Direct Investment

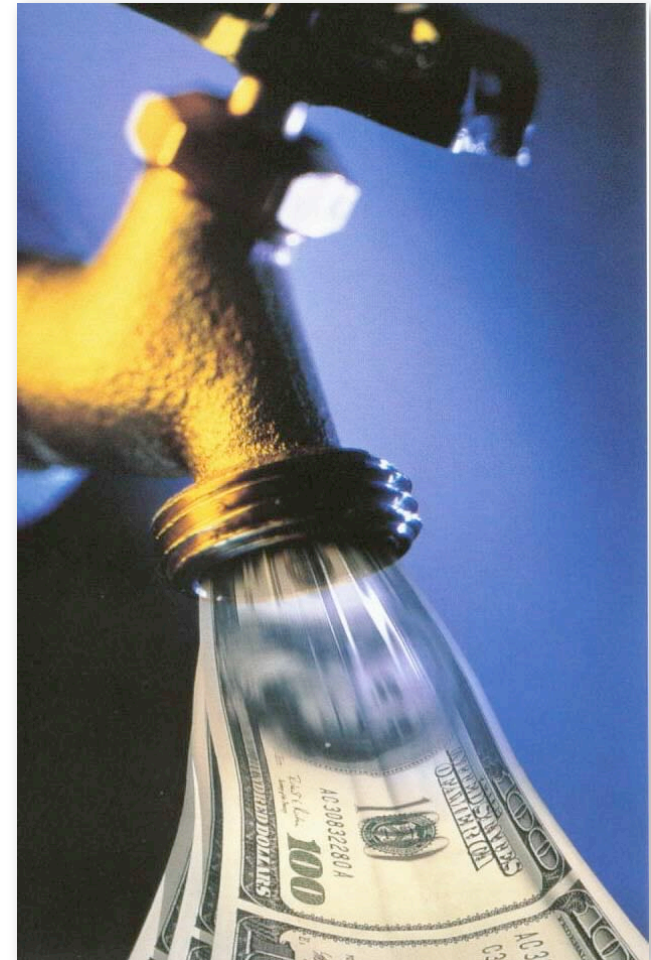
- **AIG:** Atlantic Station
 - Brownfields redevelopment
 - 8 million square feet LEED registered



Among institutional investors, U.S. life insurers hold 22% of all commercial real estate

Financing Emissions-reduction Projects

- **AIG:** \$300 million lending facility for efficiency and clean energy
- **Fortis:**
 - Preferential lending rate for energy-efficiency upgrades +10% premium discount
 - \$106 million “Green Bank” loans
- **HSBC:** \$45 million for wind projects in India
- **Mitsui Sumitomo:** Loans for building-integrated solar systems

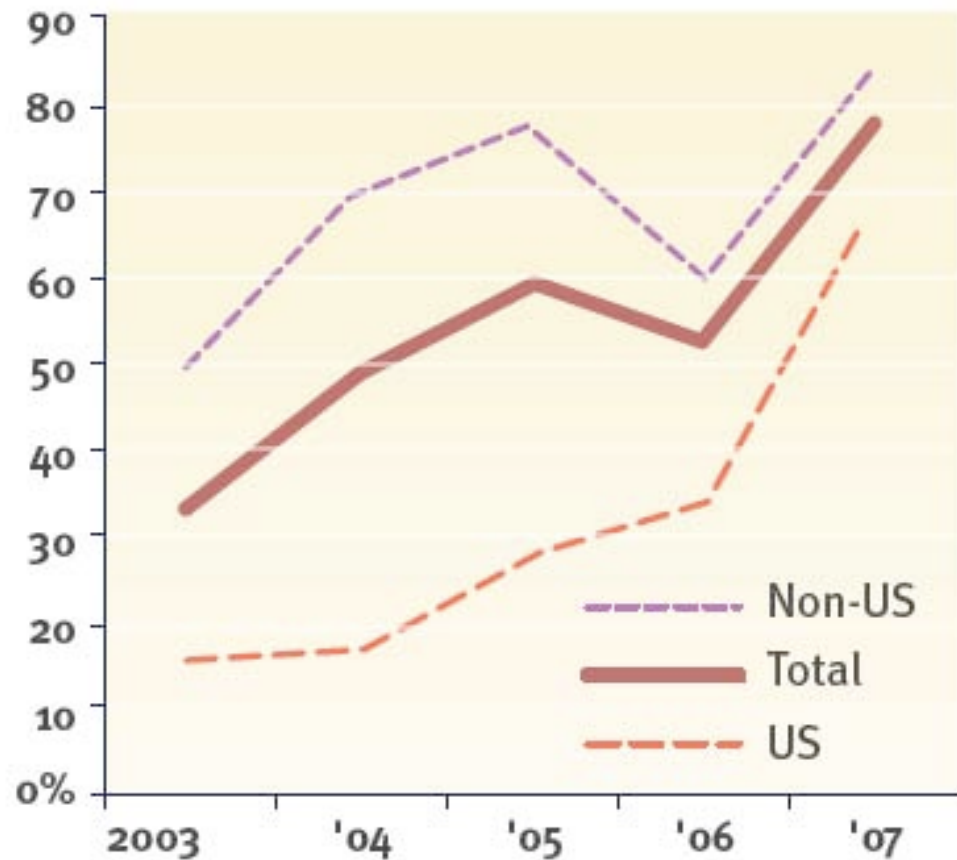


Carbon Risk Disclosure

Carbon Disclosure Project: Annual Global Survey by Institutional Investors (\$57 Trillion under management)

113 Insurer responses:
2003-2007 - ***AIG, Allstate, Aon, Chubb, Marsh, MBIA, Safeco, St. Paul Travelers, Unum Provident, Munich Re, others...***

*Carbon Disclosure Project
Full Response Rates Over Time*



Source: <http://www.cdproject.net/>

Building Awareness & Participating in Public Policy

- ***American Insurance Association:*** endorses public transportation; reduced speed limits; telecommuting based on win-win benefits to insurers
- ***Insurance Institute for Highway Safety:*** supports tightened CAFE standards
- ***Firemen's Fund, IBHS, ICLR:*** have endorsed energy-efficient building codes



Building Awareness & Participating in Public Policy



Additional signatories as of 17 Sept 2007: ACE, Amlin, ARK, Beazley, BIBA, Chaucer, Diagonal Underwriting, Equity Group, Hardy's Underwriting, Hiscox, Legal & General, Marketform, Navigators, NFU Mutual, Prudential, QBE European Operations, RJ Kiln, RMS, Standard Life, UNUM, XL

***ClimateWise* announced Sept 17, 2007. 38 insurers and trade allies:**

“We will lead the way in:

- Analysing and reducing risks;
- Support climate awareness amongst our customers;
- Incorporate climate change into our investment strategies;
- Inform and engage in public policy debate;
- And reduce the environmental impact of our businesses.”

Source: <http://www.climatewise.org.uk/>



USCAP
United States
Climate Action
Partnership

"We are committed to a pathway that will slow, stop and reverse the growth of U.S. emissions while expanding the U.S. economy."

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Welcome to the U.S. Climate Action Partnership (USCAP) Web Site

United States Climate Action Partnership (USCAP) is a [group of businesses and leading environmental organizations](#) that have come together to call on the federal government to quickly enact strong national legislation to require significant reductions of greenhouse gas emissions. USCAP has issued a [landmark set of principles and recommendations](#) to underscore the urgent need for a policy framework on climate change. [More >](#)

USCAP Members Include:

- [Alcan Inc.](#)
- [Alcoa](#)
- [American International Group, Inc. \(AIG\)](#)
- [Boston Scientific Corporation](#)
- [BP America Inc.](#)
- [Caterpillar Inc.](#)
- [Chrysler LLC](#)
- [ConocoPhillips](#)
- [Deere & Company](#)
- [The Dow Chemical Company](#)
- [Duke Energy](#)
- [DuPont](#)
- [Environmental Defense](#)
- [Exelon Corporation](#)
- [Ford Motor Company](#)
- [FPL Group, Inc.](#)
- [General Electric](#)
- [General Motors Corp.](#)
- [Johnson & Johnson](#)
- [Marsh, Inc.](#)

AIG

MARSH

Our Report: *A Call for Action*

Our solutions-based report, titled [A Call for Action](#) (PDF- 1.18 MB), is the result of a year-long collaboration. It lays out a blueprint for a mandatory economy-wide, market-driven approach to climate protection.



Our Six Principles

- 1 Account for the global dimensions of climate change;
- 2 Create incentives for technology innovation;
- 3 Be environmentally effective;
- 4 Create economic opportunity and advantage;
- 5 Be fair to sectors disproportionately impacted; and
- 6 Reward early action.

What's New

January 8, 2008 - [Top Five Socially Responsible Investing News Stories of 2007 - Socialfunds.com reports that USCAP was a key catalyst in the business community in pushing climate change to the forefront in 2007.](#)

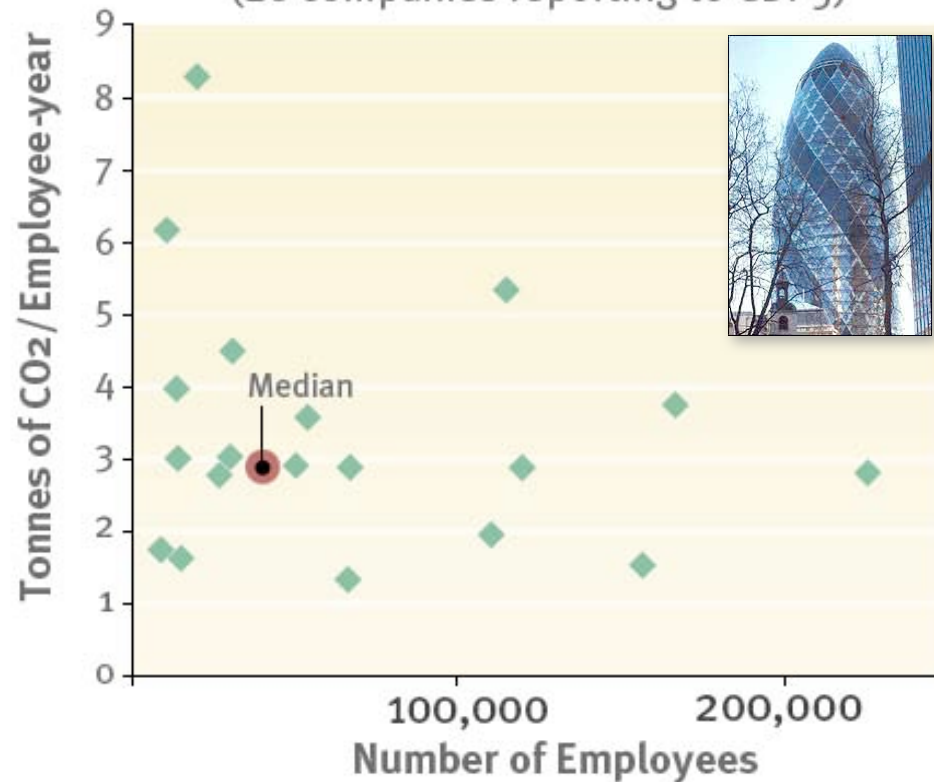
January 2, 2008 - [Top Corporate Social Responsibility News of 2007 - CSRWire reports about USCAP's role as a leader in the business community on this issue.](#)

December 10, 2007 - [USCAP Event at UN Climate Change Conference in Bali](#) (65 943 KB)

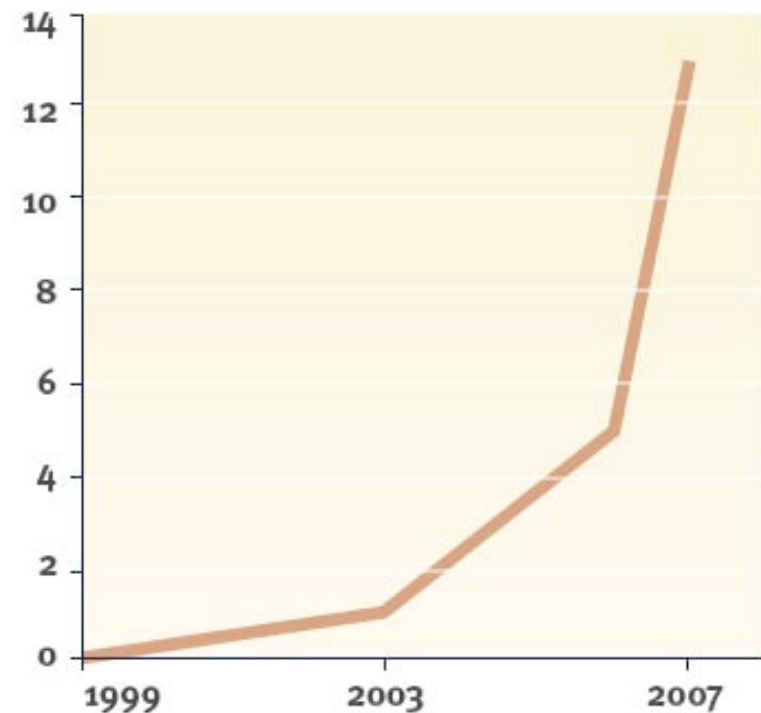
October 23, 2007 - [U.S. Climate Action Partnership](#)

Leading by Example

Insurer CO₂ Emissions Intensity
(20 companies reporting to CDP5)



*Insurers with
Carbon-Neutral Goals*



Engaged UK Entities

ACE
Admiral Group
Amlin
Aviva
CGNU
Chaucer Insurance
Cooperative Insurance
Friends Provident
Gerling
Groupma Insurances
HBOS
Hiscox
HSBC
Independent Insurance
Legal & General Group
Lloyds of London

- Beazley
- Diagonal Underwriting
- Hardy Underwriting
- Kiln

Lloyd's TSB
Marketform
NFU Mutual
Norwich Union
Premier Underwriting
Prudential Assurance
RBS Insurance
Resolution
Royal & Sun Alliance
Standard Life
XL Insurance

Others

- ABI
- Benfield
- British Ins. Brokers Assoc.
- FSA

Roles for Insurers & Regulators

- Link insurance *principles* to practice & regulation
- Follow the science (and educate one another)
- Communicate climate-insurance realities to governments
- Improve stress-testing & risk-based pricing
- Re-emphasize “industry’s roots” in loss prevention
- Collect better data & reduce blind-spots
- Elevate the practice of catastrophe modeling
- Promote and *validate* climate-friendly products & services
- Assess risks associated with climate-change *responses*
- Identify and address coverage gaps
- Integrate climate considerations into asset management
- Identify and disclose climate risks and responses
- Minimize own carbon footprints

“When the winds of change blow, some
build walls ... others build windmills.”

- *Chinese Proverb*



<http://insurance.lbl.gov>
emills@lbl.gov

